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## MEASURING TIDAL MEMORY CONTENT

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We are told that less than 10 per cent of the capacity of the lungs is disturbed during the process of inhalation and exhalation, and that there is a large residuum which remains constant. The analogy falls down if carried too far, but is there not a mass of memory material which child mind retains quite permanently and another portion which comes and goes with equal freedom?

The material given in the following tables and charts represents an attempt (1) to state in objective terms the fact that children invariably "know something" of every unit of knowledge before they come into contact with it in formal school work, and (2) to measure roughly the permanent deposit and the fluctuating material in memory content. No claim is made that the method of computation used is perfect, nor that the results and conclusions are final. The discussion will be confined to a brief interpretation of the charts and tables given, and any conclusions will be in the interrogative form.

Table I gives the results in terms of percentages of two fact tests given in one of the Minneapolis summer schools. The terms "Minimum Essentials" is probably a misnomer, as there is no general agreement yet as to just what constitutes the minimum essentials necessary in any subject of study. The teachers were asked to make lists of short questions which they thought would fairly cover the most important facts dealt with in the subjects indicated in the table. In reading, however, the figures given express judgments made on the basis of comprehension as shown through oral interpretation. The "Double Promotion" groups dealt with advanced work in the grades to which the pupils had been promoted in June. The "Make-Up" pupils studied specific subjects in which they had failed to do creditable work during the second semester of the school year. The figures in the "Grand

TABLE I

SIMMONS SUMMER SCHOOL, MINNEAPOLIS

June 21 to August 13, 1915

DEPARTMENTAL GROUP, DOUBLE PROMOTION (EIGHT WEEKS)						AVERAGE PERCENT- AGE OF INCREASE	
Room	Grade	English	Geography	Arithmetic	History		
A.....	8A.....	15-80-65	18-84-67	0-79-79	23-95-72	71	
B.....	8B.....	17-85-68	25-81-56	16-90-74	21-81-60	65	
C.....	7A.....	12-84-72	26-88-62	2-84-82	26-98-72	72	
D.....	7B.....	2-85-83	24-88-64	29-85-55	26-98-72	69	
Averages.....		15-83-68	22-82-60	20-84-64	24-93-69		
Grand average 20-88-68							
DOUBLE PROMOTION BELOW SEVENTH GRADE (EIGHT WEEKS)							
Room	Grade	Arithmetic	History	Geography	English	Spelling	Reading
H.....	6A.....	31-73-42	35-70-35	31-84-53	45-78-33		
G.....	6B.....	10-90-80	4-93-89	4-84-80	6-94-88		
L.....	5A.....	16-80-73	12-93-81	27-86-59	36-86-50		
K.....	5B.....	27-80-53		14-87-73	46-89-43		
N.....	4A.....	25-84-59			52-90-38	35-83-48	79-91-12
V.....	4B.....	23-100-77			38-97-59	35-98-63	53-91-38
S.....	3A.....	28-87-59			20-83-63	55-97-42	39-97-67
R.....	3B.....	30-82-52			27-80-53	48-86-38	28-87-59
Averages.....		23-86-63	17-85-68	18-83-65	33-87-54	43-91-48	47-91-44
Grand average 31-87-56							
MAKE-UP GROUPS (SIX WEEKS)							
Room	Grade	Arithmetic	History	Geography	English	Spelling	Reading
E.....	8B.....	33-87-54	41-63-22	47-76-29	16-71-55		
F.....	7A.....	42-77-35	47-79-32	50-79-29	43-86-43		
F.....	7B.....	22-51-20	24-76-52	20-88-59	32-71-39		
H.....	6A.....	38-86-48	38-77-39	24-84-60	39-71-32		
I.....	6B.....	51-80-20	24-80-56	40-82-42	47-81-34		
L.....	6B.....	16-86-70	14-80-75	22-90-68	31-92-61		
L.....	6B.....	19-59-40	33-54-21	13-60-53	37-54-17		
J.....	5A.....	42-70-28	21-87-66	51-84-33	44-83-39		
L.....	5B.....	22-65-43		15-63-48	20-67-47	14-81-67	
M.....	4A.....	26-75-51			61-87-26	42-80-47	72-85-13
N.....	4A.....	17-60-43			44-76-32	21-80-68	76-85-0
U.....	4B.....	42-90-48			52-52-0	55-98-43	68-85-17
O.....	4B.....	30-83-53			31-71-40	50-80-30	45-77-32
R.....	3A.....	27-92-65			40-40-0	31-98-67	58-85-27
O.....	3B.....	35-96-61				38-53-15	70-85-15
S.....	3B.....	36-74-38				23-76-53	38-76-38
Averages.....		31-77-46	30-76-46	32-78-46	38-71-33	35-78-43	61-77-16
Grand average 38-75-37							

## GRAND AVERAGES

Departmental group (double promotion).....	20-88-68
Double promotion below seventh grade.....	31-87-56
Make-up groups.....	38-75-37
School averages.....	30-83-53

MINIMUM ESSENTIAL CONTENT TESTS: First number, first test given first week; second number, second test given last week; third number, percentage of increase. The numbers are room averages.

Averages" are interesting. Do they mean (1) that in taking up new work the average class already knows from 20 per cent to 30 per cent of what they are about to study, (2) that in review work the figure is 40 per cent, and (3) that in general pupils already have about one-third of the facts we are about to teach them, when a new unit in the course is started? Here at least is food for

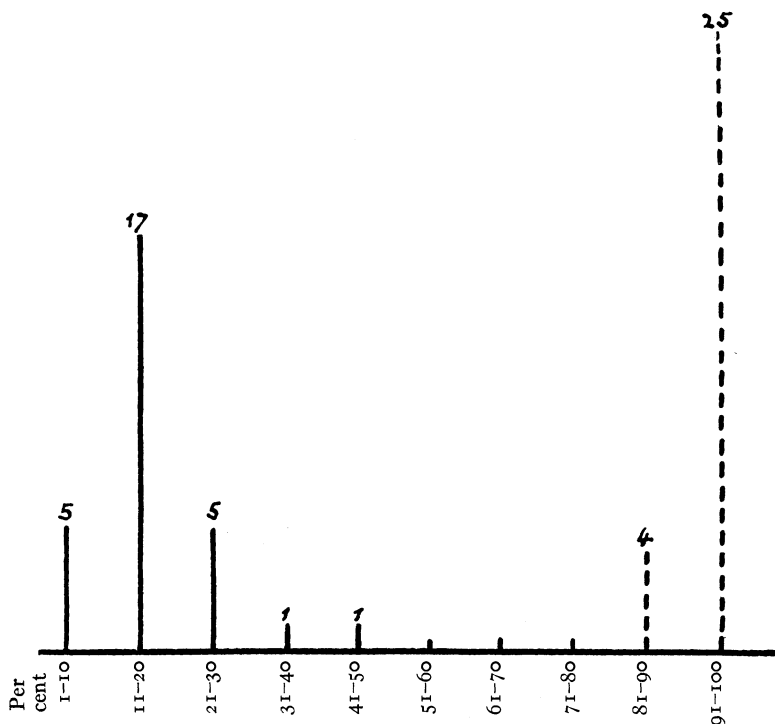


CHART I.—Nine weeks' drill in geography content with twenty-nine 5A pupils—Room "L."

Solid line=First result. Median=15 per cent. Range=6 to 45 per cent.

Dotted line=Second result. Median=97 per cent. Range=83 to 100 per cent.

thought, and the teacher who has not yet formed the habit of methodically connecting the new with the old should revise her methods.

Charts I, II, and III give a rough measurement of knowledge of geography facts in two 5A rooms in the Monroe Elementary

School, Minneapolis. About ten weeks before the close of the second semester of the school year the teachers in these two rooms were asked if they would like to make out a list of questions covering the facts to be presented in their geography classes during the remainder of the semester. Two long lists were presented, containing material about which the teachers said the children knew nothing. But this opinion was revised after giving the first test.

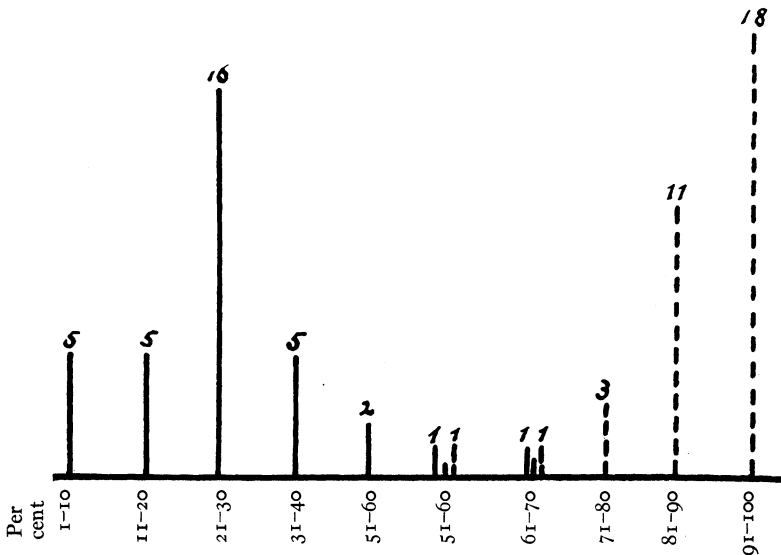


CHART II.—Nine weeks' drill in geographic content with thirty-five pupils—Room "K."

Solid line=First result. Median=26 per cent. Range=7 to 63 per cent.

Dotted line=Second result. Median=91 per cent. Range=57 to 100 per cent.

Chart I should be read as indicating that five pupils knew from 1 per cent to 10 per cent of the questions asked in the first test; 17 pupils knew from 11 per cent to 20 per cent, etc. There was an actual range of knowledge from 6 per cent to 45 per cent, and the median was 15 per cent. At the second test in Room "L" after nine weeks' study the range was only 83 per cent to 100 per cent, and the median as high as 97 per cent.

Chart II gives similar results from Room "K." Chart III compares the two rooms on the basis of their improvement after

nine weeks' study. It is very plainly seen that Room "L" has done better than Room "K," (1) because the median of increase is higher by 17 per cent, and (2) because the range is less by 37 per cent; for uniformity is desirable in the acquisition of memory facts. Two plus two can never be anything but four.

Do these three charts show that pupils know on the average of 15 per cent to 28 per cent of fifth-grade geography facts before they are presented in class? It will be noticed from Table I that the initial content number for double promotion geography work is

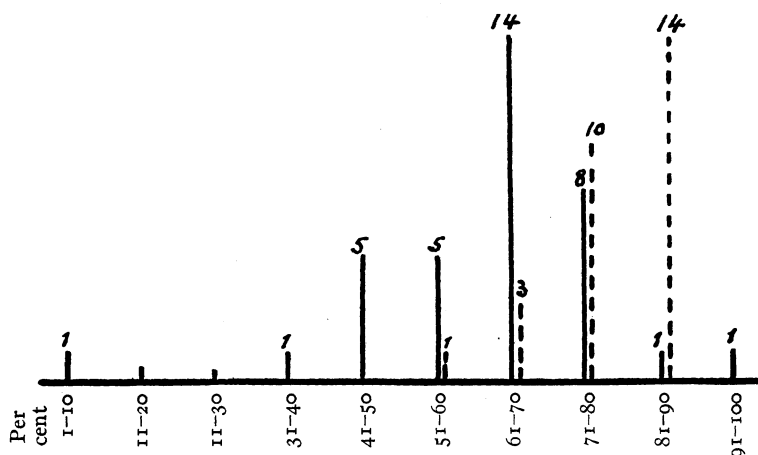


CHART III.—Nine weeks' increase in geography content

Solid line=Room "K." Median=64 per cent. Range=15 to 86 per cent.

Dotted line=Room "L." Median=81 per cent. Range=55 to 92 per cent.

from 18 per cent to 22 per cent and in make-up work 32 per cent. Is this confirmation or chance? At least, is there not again a lesson which should result in the invariable recognition and use of apperception masses in giving the children credit for what they already know in terms of definite attitudes and practices and carefully selected curricula which shall be valuable from the standpoint of the known advancement and needs of individual pupils?

Table II and Chart II present an attempt to measure, not initial content, but increase in power to use facts through drill

which firmly welds associations already pretty well established. A room of forty-five 2A children was used during the latter part of the second semester of the school year. Twenty of them had been studying the number combinations since the preceding September; about a dozen began them the preceding January; and a few had come into the group by transfer later. At the time the first test was given, it was said that all of the pupils knew the forty-five combinations, and the result of the test proved that this was

TABLE II

THE MONROE ELEMENTARY SCHOOL  
MINNEAPOLIS

Seconds	Seconds
33-59-87-117	17-51-64-88
36-59-88	27-52-66-89
38-61-88	27-53-67
41-66-90	35-54-67
43-71-90	40-54-68
46-72-92	40-54-68
47-74-93	41-55-68
47-75-93	41-55-68
49-76-93	45-57-69
52-76-95	47-57-70
52-77-100	47-59-73
54-77-101	49-59-76
54-80-105	49-59-77
55-81-113	49-60-80
57-83-117	50-64-84
First Test	Second Test
Median 76 seconds	Median 57 seconds
Range 33 to 117 seconds	Range 27 to 89 seconds
Ten days' improvement in the forty-five number combinations.	
Forty-seven 2A children.	

true. One child repeated them in 33 seconds, one in 36 seconds, one in 38, one in 41, etc., up to the two slowest who used 117 seconds. But it was decided to find out *how well* the children would know the combinations after ten days' more drill during the ordinary program periods. The second column in Chart II seems to say that they know them better because they had more complete control of them in reproduction. First, the median was lowered from 76 to 57 seconds, and, secondly, the range was

lowered from 84 to 62 seconds. These facts are shown graphically in Chart IV.

In short, every child is not a little modern Columbus when he begins a so-called *new* unit of school work. The waters which he is about to traverse may be the same in kind and different only in

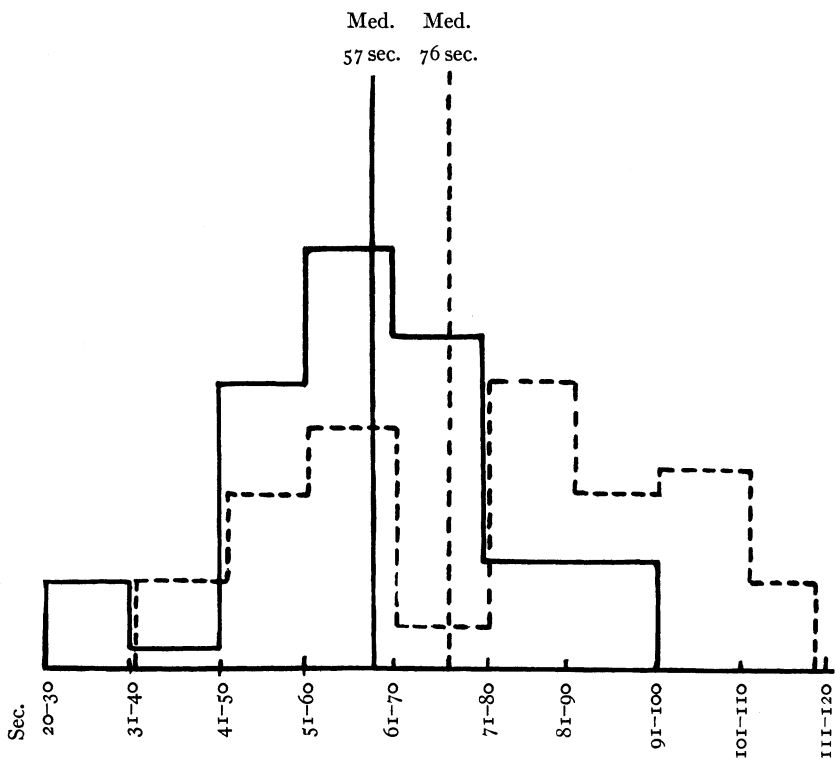


CHART IV.—Ten days' results. Decrease in time required to give forty-five number combinations to forty-seven 2A children.

Heavy line=Second test. Dotted line=First test.

degree. They may be but a connecting strait leading from land-locked bays of previous knowledge out into the big ocean of a wider, more man-like experience. The teacher's function is that of pilot. He must know the geography of child mind.